This ability to reconcile the two viewpoints enables confidence and trust that the PM and the project office really understand the mission. With that trust and reliance on the expertise that project office members bring to the fight, we broaden an appreciation for what Army acquisition can do across the Army spectrum.

A response to the label "businessman in uniform" should be, "I am an acquisition professional doing my job to help the Army, just like you. Let me explain what we bring. One team, one fight."

COL JOHN D. BURKE serves as the Director, Unmanned Systems Integration, Army G-3/-5/-7, HQDA. He has served as a project and product manager in Aviation and Battle Command programs since 1987.

News Briefs

Augmented Cognition Technology to Help Warfighters Handle Information Overload

Natick Soldier Center

Scientists at the Natick Soldier Center (NSC), the Defense Advanced Research Projects Agency (DARPA) and Honeywell Corp. are developing augmented cognition technology to solve the modern warfighter's new and overwhelming problem — information overload.

"Augmented cognition is a very important program for the Army because it will increase survivability and effectiveness," explained Henry Girolamo, the NSC DARPA agent for the Army's Augmented Cognition Program. "The technology we are developing will ultimately help warfighters when they are under stress and faced with information overload, and it will significantly improve mission performance."

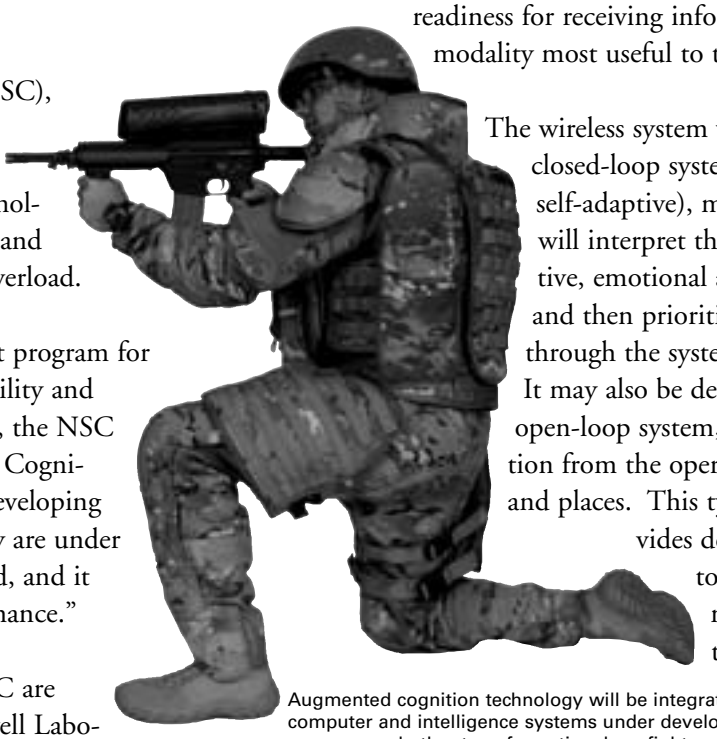
According to Girolamo, DARPA and NSC are managing a research team led by Honeywell Laboratories that foster the development of prototype systems that can detect and measure a combatant's cognitive state. The technology will assess the warfighter's cognitive state and then influence the way information is sent to the warfighter. This capability will be integrated into communications, computer and intelligence systems currently under development in the U.S. Army's Future Force Warrior (FFW) program and other transformational warfighter systems.

Less Stress for the Warfighter

Augmented cognition systems are expected to reduce warfighter stress by adjusting information management to the combatant based on his cognitive, physical and emotional states as well as environmental conditions. The augmenting system features neurophysiologic sensors that assess the warfighter's focus of attention. The sensors measure and record brain activity as well as physical responses, such as heart rate. This technology will help enhance warfighters' decision-making capabilities by helping them determine which available information is most important, and then to help them decide the best course of action in varying environments. The system will be designed to adapt to each warfighter's preferred learning style, such as whether they respond better to audio, visual or tactile cues and instructions.

Augmented cognition technology may be designed to respond to the context in which the warfighter is operating. For example, if Soldiers are moving in a tactical line formation, the system could use this information, along with brain signals, to better determine the state of attention and readiness for receiving information and in the modality most useful to the Soldiers.

The wireless system will primarily be a closed-loop system (i.e., internally self-adaptive), meaning the system will interpret the warfighter's cognitive, emotional and physical state and then prioritize information through the system for the warfighter. It may also be designed to be an open-loop system, funneling information from the operator to other people and places. This type of system provides decision-making tools to a commander or a medic and assists them in directing or



Augmented cognition technology will be integrated into communications, computer and intelligence systems under development in the Army's FFW program and other transformational warfighter systems. (NSC photo by Jane Benson.)

helping the warfighter during mission execution. Open-loop technology is easier to design and allows Soldiers to receive information from remote sensors on equipment so they will be aware if the equipment is functioning properly.

Staying Focused on the Mission

Related studies performed by the U.S. Army Research Institute of Environmental Medicine have shown that sleep deprivation, exertion, hunger and exposure to temperature extremes can reduce the warfighter's ability to focus his attention and process information, which can lead to making poor decisions. NSC has also been exploring how humans process information while on the move and how this influences decisions and mission performance.

According to Dr. James Sampson, Human Factors Engineering Consultant, "Augmented cognition technology is the result of advances in neuroscience, computer technology and neuropsychology. Much research and engineering still needs to be done, but there is considerable promise in this technology for the military. In the future, it will be possible that this same technology will be used by the public at-large to manage information for a wide range of applications." For example, drivers may have such systems to help them be more situationally aware as they negotiate unfamiliar and complex networks of highways.

The goal is to incorporate the technology into the FFW program by 2007. For more information about the Soldier Systems Center, go to **http://www.natick.army.mil**.

Developing Nanostructured Advanced Protection Technologies for Ground Vehicle Systems

Ashley John

Using transparent armor to safeguard Army vehicles has been on the military's wish list since the 1960s, and the reality may be closer than ever. The U.S. Army Tank Automotive Research, Development and Engineering Center (TARDEC) is partnering with industry to develop a lightweight, transparent ceramic armor that can be applied in both military and commercial settings. Transparent armor solutions are at the forefront of an evolutionary transition into a major technological collaboration between the military and industry.

During the summer of 2005, Nanocerox Inc., a small technology-focused business based in Ann Arbor, MI, and lead partner General Electric's (GE's) Global Research Center, received $4 million to develop next-generation transparent armor. Congress appropriated the funds to support research in nanostructured armor materials.

The project entails developing both opaque and transparent armor solutions through the use of nanotechnology. TARDEC, Nanocerox, GE Global Research, the U.S. Army TACOM Life Cycle Management Command's (LCMC's) Cost and Systems Analysis Team, U.S. Army Research Laboratory and Program Manager Light Tactical Vehicles (PM LTV) are collaborating on a groundbreaking cost study to develop the break-even point for advanced transparent armor versus conventional transparent armor. TARDEC is taking the lead to ensure the nanostructured solution is cost-effective.

Nanostructured Transparent Ceramic Armor

The cost for current ballistic armor is substantial — monthly material costs alone exceed $1 million. Cost is not the only reason for researching transparent armor solutions. The ballistic glass currently being used adds hundreds of pounds to military vehicles. It also has the potential to create high levels of distortion and glare. Both of these concerns might be eliminated by use of nanostructured transparent ceramic armor. The weight is greatly reduced, while increasing warfighter protection.

TARDEC and industry are looking at new technologies for ground vehicle systems. Team members include (from left): Dr. Anthony C. Sutorïk, Nanocerox Director of Research; Dr. Douglas W. Templeton, TARDEC Emerging Technologies Team Leader; Dr. Christine M. Furstoss, GE Global Research Global Technology Ceramic and Metallurgy Technologies Leader; Dr. Mohan Manoharan, GE Global Research Nanotechnology Program; Richard Barnak, TACOM Cost and Systems Analysis Analyst; Lisa Prokurat Franks, TARDEC Materials Engineer; and David Holm, TACOM LCMC Cost and Systems Analysis Team Leader.

"Through nanotechnology research and development, we will be able to increase ballistic capabilities of transparent armor," said Steve Swanson, Nanocerox Chief Executive Officer. Nanostructured transparent ceramic armor's structure makes it stronger, harder and lighter than conventional transparent armor. The team is looking at new nanostructured advanced protection technologies for ground vehicle systems. Complex protection systems require materials with:

- High mass efficiencies
- Superior strength
- Damage tolerance under multiple impact conditions

Transparent armor also requires a very low distortion rate. Rapid progress in nanotechnology provides a unique opportunity to procure a tailor-made material with properties that surpass those of current transparent armor.

Teaming Technology and Research Initiatives

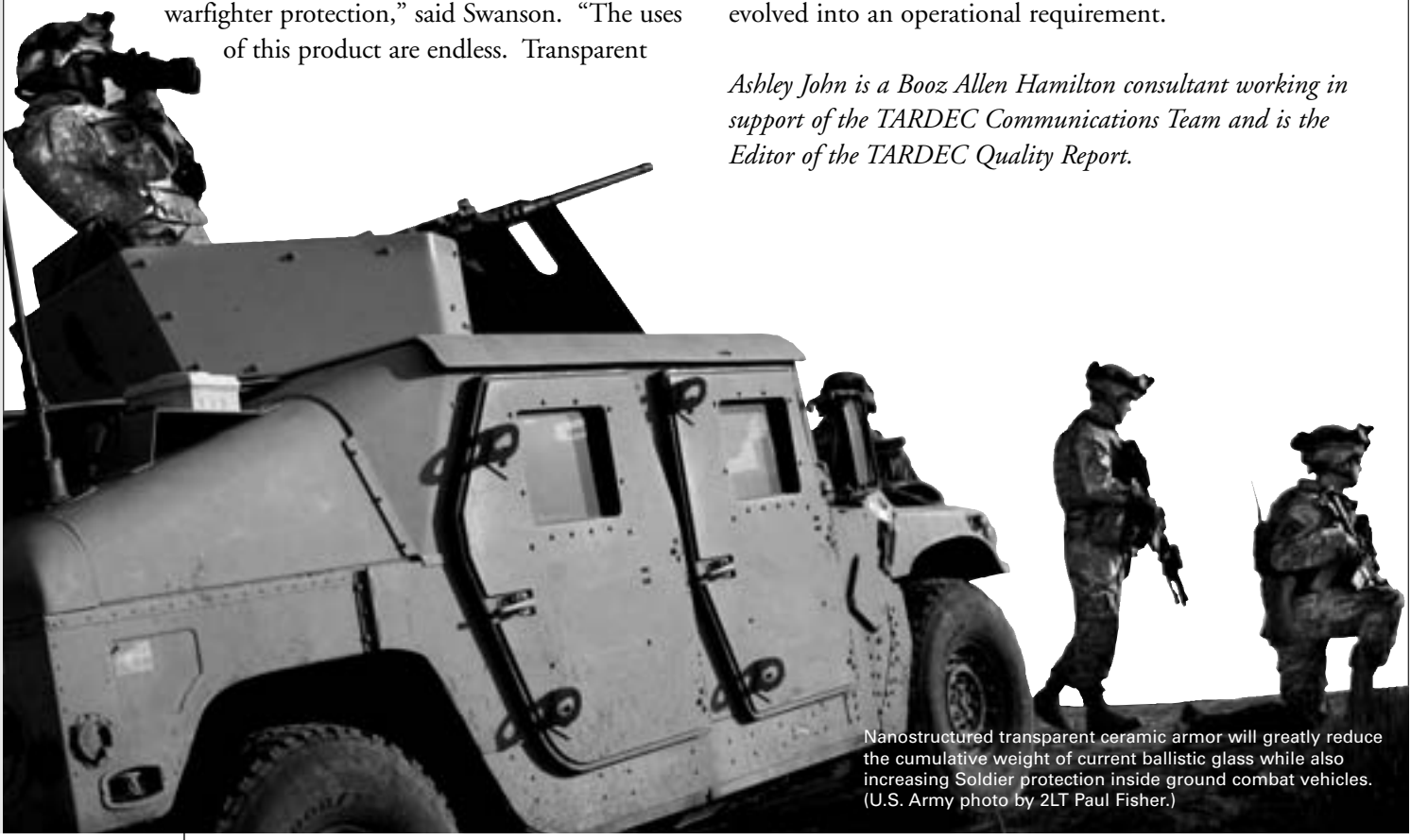
Developing unique, nano-engineered armor materials for armor systems by combining mechanical, optical and sensing properties allows for multiple uses. While DOD is focusing on the military applications of advanced transparent armors, industry is focusing on the commercial applications of nanostructured, transparent materials. "The armor will be serviceable to light and heavy combat vehicles, aircraft and missiles, and face and body shields that can be used for warfighter protection," said Swanson. "The uses of this product are endless. Transparent armor would have many applications in homeland defense and law enforcement vehicles. It would also have architectural design application where increased strength is required to deal with man-made and natural threats."

By making this a joint military and industrial research projtect, a national, cost-effective basic research effort will quickly provide much-needed products for warfighters in the field. "There is potential to achieve the accelerated development of advanced transparent ceramic materials by making this a military, small business and GE Global Research effort," commented TARDEC Director Dr. Richard McClelland.

"The work done at Nanocerox is on the cutting edge of 21st-century armor for our troops," said Rep. John D. Dingell. "I am confident this work will lead to better, more advanced armor solutions getting to the brave men and women in the U.S. military."

TARDEC is an integral player in bringing nanotechnology government and industrial researchers and PM LTV together to ensure that this is a coordinated military and industry effort, and that the path to procurement is established and shortened. The Army and industry are at the forefront of groundbreaking developments in nanostructured transparent armor. Armoring the Army has evolved into an operational requirement.

Ashley John is a Booz Allen Hamilton consultant working in support of the TARDEC Communications Team and is the Editor of the TARDEC Quality Report.



Nanostructured transparent ceramic armor will greatly reduce the cumulative weight of current ballistic glass while also increasing Soldier protection inside ground combat vehicles. (U.S. Army photo by 2LT Paul Fisher.)